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AUTHOR Lindsay, John
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ABSTRACT

Information systems design is at a crossroads of changes in technology (microcomputing, software engineering, and telecommunications) and the administration of social systems, of which urban and regional planning are a part. Training in information systems design will be beneficial to four distinct groups of people: clerical and technical staff; new information professionals; middle- and senior-level planners; and policy makers. The training process must take an integrated approach to systems design, rather than attempting to formulate technical solutions to technical problems. Planning authorities need to develop local information plans which would include mapping the current information infrastructure and constructing a development program. Training of clerical/technical and young professionals can be best accomplished within the country. Senior-level training should occur out of the country, through a combination of short courses, conferences, and seminars, or by one year of Masters of Science level courses. Policy planners will benefit from sensitizing, rather than training; it is probably best achieved through short seminars. Experiences in other areas of administration where the same issues are being confronted should be utilized, and the formation of documentation centers in regional centers of excellence would help to offset the slender range of teaching materials available. There remains a dilemma, however: those who are best equipped to see the need for an information plan and the value of training in systems design may not be in a position to influence policy decisions. Further, the process of designing an information system is likely to uncover institutional antagonisms. (56 references) (SD)

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TRAINING IN INFORMATION SYSTEMS DESIGN FOR URBAN AND REGIONAL PLANNERS IN DEVELOPING COUNTRIES

A CONCEPT PAPER PREPARED FOR THE UNCRD

BY

JOHN LINDSAY

SCHOOL OF INFORMATION SYSTEMS DESIGN
KINGSTON POLYTECHNIC

AND

DEVELOPMENT PLANNING UNIT
UNIVERSITY COLLEGE LONDON

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TO THE EDUCATIONAL RESOURCES

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Abstract

This paper situates the design of information systems at the intersection of changes in technology (microcomputing, software engineering and telecommunciations) and the administration of social systems, of which urban and regional planning is a part.

It suggests that there are four distinct groups of people for whom training will be of benefit: clerical and technical; young professionals; middle and senior level planners; and policy makers.

It suggests that the training process must grapple with the problem that change in attitudes about administration, and the organisation of information are central to the design of information systems, rather than simply a technical attempt to solve a technical problem. The traditional training has sepa the differences in academic disciplines so that an integrative approach has been difficult to develop.

The planning authority, it goes on to suggest, needs to develop a local information plan, which will include mapping the current information infrastrcture and a development progamme within which training will be located. Training of clerical and technical workers can be best done in-country, though not necessarily in-institution. The budgetry requirements of this training should not be underestimated. Training of young professionals too can best be done in-country and an urgent aid programme is needed to build this facility where it is weak. Some examples are given.

More senior training can best be done out of the country so that the best benefits of cross-fertilisation can be achieved. This work can be done through a combination of short courses and conferences/seminars or by M.Sc level one year courses. The contribution of the building of professional organsiations as an aid to training is indicated.

For policy planners, it is suggested, the term 'training' is probably inapposite. The experience sensitising is probably best achieved at short seminars, which are likely to prove expensive to run.

Various different courses, mostly run within British Universities, are examined which, in the opinion of the author, indicate different approaches to the exercise. It is suggested however that we have still very slight experience on which to draw, bourn out by a survey of the literature. There are however a number of areas of administration where the same issues are being confronted. Narrow specialisms or institutional jealousies should not be allowed to prevent cross-fertilisation

Similarly the range of teaching material on which we can draw is slender. The formation of documentation centres in regional centres of excellence would make a valuable contribution.

The paper warns of a dilema: those who are best equipped to see the need for an information plan and to see the value in training

in information systems design are unlikely to be in a position to influence the policy decisions necessary for implementation.

Further, implementing a designed information system is likely to uncover a number of covert institutional antagonisms, the likely appearance of which training must point to.

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1. INTRODUCTION

Training in information systems design is in its infancy. Schools of Computer Science have trained a generation of programmers, but only now is the computer press begining to advertise for people who can design information systems. What is information systems design? The question gets the answer, "It's something to do with computers isn't it?" or "That's payrolls isn't it?"

Information used by urban and regional planners comes from a variety of sources, statistical, cartographic, administrative, and planners are trained in a number of disciplines - sociology, demography, cartography, architecture, engineering, statistics, geography. Each of these disciplines has its own traditions of gathering data, validating it, converting the data into information, using the information for planning, and advising policymakers.

But it would take a considerable stretch of the imagination to call any of these an information system. I can cite no local or county authority in Britain which operates an integrated information system; in fact only now is the idea of a local information plan having its initial trial feasability study undertaken. There is no national information strategy or plan. It is not suprising that there is little training.

In this paper I have tried to give an indication of the few emerging examples which are available of the different ways in which training is being approached. I have divided it into training for clerical and technical staff, training for new young professionals, for middle and senior level planners, and for policy-makers.

Training is now the subject of a considerable literature; I have tried to avoid discussing the topic in general. The technology used in the processing of information is similarly the subject of a huge variety of journals and papers; I have tried to give simply a pointer to the changes which are most significant in the designing of information systems.

From each of their own traditions, users of information have described how they capture and organise their data. But what we now want is the integration of the information resources of an urban or regional government into a system. That requires information planning.

The questions which remain unanswered in this paper are firstly whether it is better to take planners and try to teach them how to design and implement information systems for the process of planning or whether a thorough grounding in computer science is the essential starting point; secondly which part of the governmental structure should provide the lead in the co-ordination of information planning?

I think my general conclusion is that we don't have enough experience to be able to draw any general conclusion. We are still at the level of innovation so that the idiosyncracies of the particular situation make it difficult to generalise.

What we have to try to get away from is the pattern whereby each type of information user describes his tradition as <u>the</u> information system.

We also have to make more clear that information systems are <u>part</u> of the political process, not something standing above it. Information is part of the jostling for power and influence within institutions, and part of the process by which the propertyless are kept in their condition.

But designing an information system can help to make clear the absurdities of bureaucratic procedures. It is to awaken that desire that training should be directed.

2. INFORMATION SYSTEMS AND THEIR USERS

The recent book, edited by England and others, summarises current practice in Britain on information systems for local government. They show each of the different parts of government from which information is generated, and how each part of local government has organised its information. Even more recently, in May 1985, the papers of the Computers in Planning conference, dealing with development control systems show the central issues of concern to British planners.

Each of these also shows the specific nature of the problems facing British planners - an antagonism between central government and local government, severe restrictions on public spending, a drive to open to competition and profitablility social provisions which had previously been seen as public services. During this time rather than be concerned simply with physical planning which had marked the town planner, they have been forced to take into account the wholesale destruction of jobs and examine the planning of the whole community under the influence of the argument that the marketplace is the only effective planner.

Their need for information and the types of information system which will satisfy those needs must therefore change. The BURISA newsletter, now at number 72, has chronicled this shift in need and given rich evidence of how planners have responded.

Nor do I think it is a purely British phenomenon, though the details might vary. The recent international conference in Toronto organised by URISA addressed these questions as did the OECD work on urban change. In developing countries the rate of change is that much greater, the resources available that much slimmer, the need that much greater.

There have been a number of inventories of information available for government of one type or another. Salmona and de Man are two examples. There does tend to be a separation between documentary, cartographic and statistical information, but this reflects historic experience. It is only with the development of integrated packages that the point of linnking different datatypes becomes clear.

The method for designing information systems which I support starts with the identification of all significant information sources, contructing the information map. Training requires the preparation of material for the identification of these sources and the methods by which the information can be gathered.

As national or local information plans are rare the preparation of the information map requires negotiating a political minefield in which the local peculiarities preclude prescription. In turn it is insufficient simply to identify sources, the planner must be able to form an opinion of their verity.

Although a number of papers have covered in varying detail many of the issues involved in dealing with these different sources of data, because I want to look at how the planner must attempt either to integrate them or draw on them, I summarise here some which I think are relevant.

2.1 Demographic data

After the master plan, finely printed and bound, which planners on my course identify as their information source, the next most frequently remembered is the Census. The practice of taking a decenial census is common in most parts of the world, though the results will vary enormously in reliability and speed with which they become available. To plan with data

gathered once every ten years, the published tables for which appear five years after the data was gathered, is a fraught exercise. This is particularly true as units of measurement, administrative boundaries and definition of category are continually changed. This is not peculiar to developing countries. England's book spends quite some time on methods used to provide more accurate data than the census.

The rate of change of population distribution through migration and mortality render much of the data useless. However new technology means that if only census data can be accessed at the right time and in the right place its use to planners can be increased. Knowing what to ask for and where to ask is one of the issues with which training in information systems design must deal.

Training the census planners would help. But that must be the issue of a different paper.

2.2 Economic data

Central banks maintain data about currency and imports/exports. Customs departments collect facts at border posts. Ministries of Economic Development or Planning Commissions keep data. This data though is usually collected for a national entity. Within a country there is usually no spatial component so information about a city or a region cannot be gleaned.

Chadwyk Healey has made available on microfiche the annual reports of the world's central banks as collected by the IMF in Washington, which at the level of planning of the supra-national region might be useful, as it might for comparative work. The INTIB database of UNIDO, and particularly the work they are doing on historically correcting data on the basis of correlating evidence is worth drawing attention to.

Also interesting is the work of the British Central Statistical Office which is providing montly and quarterly statistical data on floppy discs.

Economic data from taxation records, even if planners could gain access to it would be of doubtful use. The level of illegal economic activity and the extent of the informal sector too make any attempt at gathering information an exercise which requires much questioning of presumptions during training at all levels. Cultural presuppositions on questions such as female headed households show planners at times to be so blinkered that training in information systems design has to include a much wider syllabus to make clear the hidden curriculum within which they usually operate.

Micro-economic studies can provide fruitful evidence. In the section on information sources I refer to the need for better integration of information services. Correlating the results of micro studies with macro information systems is an aspect of training and of information systems design which bureaucratic compartmentalisation has made difficult. Getting the planner to reflect on his private life, his own day to day experience of his relatives and family is a useful antidote to some of the more extreme reliances which are placed on economic information. This too should be introduced into training programs.

2.3 Housing

Housing surveys and housing needs surveys are legion. Often though they ask questions at a level of detail which makes the exercise so expensive that no money is left for plan implementation or at a level of generality that no useful conclusions can be drawn. Failure to document leads to wasted resources. Lack of stable reference points weakens useful comparability. Where the rate of change is great the value of unco-ordinated snapshots must be

queried.

The survey is also an intervention into the life of those surveyed. Experience from the fields of community participation and gender-aware planning needs to be structured into training in information systems, particualrly awareness of the informal information system.

Every survey will have its value increased if it can complement the building of the planner's information system and if resources are allocated for this sort of work. This element of the design process has little exemplary material on which to draw, but that is no reason for not underlining its importance.

We need also to consider the organisation of housing tax and housing finance. Much work has been done on methods of recovery and rates of return, but less on recognising that these programmes are a source of data for policy and planning. It is possibly worth making here the general point that an information system, the real function of which is the improvement of policy, will be more likely to get off (or even onto) the drawing board, if it can be shown to be capable of paying for itself. Packages like that of UNCHS can generate data which in turn can inform the planning process. The integrating of these parts into the information systems design require training in both knowledge of what is available and in how to make these compatable. Two papers given at a meeting of the British Computer Society in May 1986 discuss these issues in more detail.

There are particular difficulties with the data collected by Housing Banks and Housing Finance Corporations, where they are separate from local authorities or government. The extensive networks of local agents which they require though make them a valuable resource.

2.4 Land/property registration and cadastral surveys

The emerging stability of an area can in part be measured by the detail and accuracy of its land registration. The ITC in the Netherlands has put considerable resources into training planners in the techniques of cadastral surveys and the setting up of land registration databases.

Developments in remote sensing are changing the economics of data collection on large scale areas. Digitised mapping provides another element of the integrated planning information system. Training in surveying techniques and cadasters has possibly been too separated from training of planners. This is an area where training in the intergrative elements of ISD will be most needed.

The most difficult part is the setting of proper levels of sophistication in areas of very fast change or areas where attempts to alter patterns of land tenure will be perceived in the setting up of an information system. Training needs to pay as much attention to the political issues as the design issue, and the design has to be sensitive to the structural questions rather than simply the technical ones.

2.5 Transport

Planning and monitoring transportation systems has traditionally been an extremely expensive and extensively documented exercise. There are also wide varieties of computer-based techniques and applications, including those for micro-computers.

However the separation of road from rail, sea and air at government level and within the industry has not led to a practice of monitoring transportation as an integrated system. The fault lines are considerable. Further the antithesis of public and private transport, irrespective of

the suitability of a particualr mode for that economy, has bedevilled attempts at integrated planning.

The separation of transport planning authorities from other aspects of general planning has led to further fault lines.

Many of these faults have been replicated in developing countries, accentuated by the scale of the problem. Training in transportation information systems needs not only to be sensitised to arguments within transport planning about appropriate transport systems, but about the integrative aspects of planning information.

Interesting work in Australia has shown how the combination of a digitised map database can make traffic surveying for example much more simple and cheaper, using colour and microcomputers. The digitised mapping along with traffic patterns in turn feeds into land use policy decision support systems.

Information transportation rather than people or goods transportation is a factor which technical changes are making more important. Training in ISD needs to place increasing importance on the economics of the economics of the complexities of these choices.

2.6 Telecommunications

Telecommunications, usually provided by a central national body, despite so-called market forces or privatisation. It is also only now being recognised for its full economic implications and entering national planning processes. Within urban areas the telecommunciations aspects of network planning as well as node and line location factors need to be taken into account. The enormous level of technical detail which has to be grasped makes the communications aspects of ISD difficult for the non-communications expert.

However digitised data flows, optical fibre, satelites and OSI seven level standardisation have the potential to so change the economics of information transportation which increase the importance for both general planning and administration method and for ISD. The temptation to say that these advanced technical issues have no place in developed countries must be resisted. The difficulty in training information scientists and engineers in the communications aspects has to be overcome.

2.7 Energy and power

The provision of these facilities is again often the responsibility of other authorities than either the urban planners or the regional planner. However the databases which these bodies are capabale of setting, the economic consequences of not integrating the information component and the real practical difficulties experienced in many older cities ought to provide proof of the importance to be attributed to paying proper attention to this. In addition the thorough monitoring which follows from the consumption and repayment information generated can provide important datasets for more general monitoring and planning.

Training the administrators and planners of the energy or utility suppliers seldom takes into account the more general urban or regional planning implications, and change in this area is likely to prove difficult. However training the urban and regional planners in how to influence the design exercises of these authorities has more hope of success if backed up at the right political level.

2.8 Education

If primary and secondary education planning is the responsibility of the local authority then data here provides potentially two functions, in the planning of education provision itself and the in provision of check data on other operations.

The proportion of children actually undertaking education is liable to distortion as is the monitoring of success, but this data can be compared with demographic and employment figures.

Tertiary education frequently falls to the responsibility of other authorities which raises again the planning necessary for the implemetnation of the information system. Where the primary and secondary school system has been developed to cover a significant proportion of the population then the institutional base exists for local level data collection which could prove invaluable, allowing also for a more stable time series than other data sources.

2.9 Health

Health planning is usually the responsibility of another ministry or authority. Much data might well be collected and maintained, but manual case load information handling makes aggregation to the level useful for health planning, never mind more general planning, difficult. Technical developments are opening up possibilities here which could provide useful checks on demographic data and projection series while potential epidemological data could prove invaluable.

The role of the urban or regional planner in disaster planning makes an argument why health data ought to be made available which can help to overcome the resistance of the health authorities to another outside information requirement.

2.10 Water

Monitoring water consumption and planning settlements with the availability of water has not been traditionally one of the functions of local planning in Europe. Discussion of general information systems makes no mention of water supply.

However in developing cities the availability and cost of water supply is crucial. Data generated from monitoring of water availability and consumption patterns needs to be accessable to the planning authority. There are a number of methods whereby this can be done easily and cheaply. Inplementation of systems which appear to change the pattern of charging or the costs of water are likely however to meet resistance.

2.11 Food and supplies

The movement of goods into and out of cities, their impacts on the areas of food supply and the planning of urban areas relative to the availability of areas to sustain them implies the organisation of bodies of data which appear remarkably lacking in the literature.

I have remarked already how the national focus of trade data makes it difficult to understand the development of local economies. Without this level of information though planning becomes guesswork. The work of the GLC has shown something of what can be done in this area.

2.11 Waste disposal

Here is another aspect of the essential function of local government from which data can be

gathered at least to check other aspects, apart from the esential data for the planning of the operation itself.

The most interesting information systems design questions though are probably properly part of administration rather than planning.

2.12 Police

Police information systems are probably better left out of this survey altogether as they raise questions of such enormity that insurmountable difficulty arises. The attempt in Britain to make local authority planners in part responsible for civil disturbance planning after a nuclear holocaust has put these issues clearly on the agenda. The training of planners in information systems design needs to pay more attention to these matters.

2.13 The varieties of users

In discussing training in information systems design we have to distinguish national level planning, regional level, metropolitan level, large city level, small and medium town level. Though rural planning is outside the brief of this paper, the relationship between town and country is so closely interwoven that I would like to suggest a continuum. In any case, much of the data required for regional planning, and much of the data required within a city requires information about the surrounding areas such that eliminating rural areas will simply create an unhelpful gap.

The planners will come from a variety of backgounds and professional traditions - statisticians, geographers, economists, architects, accountants, librarians, lawyers. It depends on the particular local situation whether the intention is to train the planner in information systems design, or take information engineers and introduce them to planning, or better to define the training tasks to produce the information system planner. The strengths and weakensses of the environement must form the foundation on which these decisions are built.

Each of these disciplines has its own traditions. We can see here another value of technical change. Computerisation is throwing up all sorts of new techniques and is blurring boundaries.It is building up an institutional insecurity that is capable of weaning people from professional traditions, picked up in the developed world, with long traditions of specification and division of labour unsuited to more fragile economies.

2.14 Co-ordination of development

Within the multiplicity of agencies of any human settlement there is an enormous amount of data. Every time an activity takes place it draws on the data of the past and changes it. There is a value in planning the organisation and supply of information as well as planning and administering the organisaiton. However institutional jealousy and the recognition of the power which comes from processing information means a war of position fought among its hoarders which is a continual drain on the resources of the area. The training of systems designers needs to be able to move to the highest level of political abstraction to understand the management of complexity as well as down to the most basic level of technicality.

2.15 Planning or the market?

The argument has been raised that the market is the best mechanism for a general planning strategy, which has resulted in a sustained attack on the planning profession. In turn the argument has been raised that information, like anything else, is a marketable commodity

and only that for which demand has created the conditions by which a profit can be generated needs to exist.

Many western aid agencies are increasingly emphasising the importance of privatisation. This is an issue which training in systems method needs to address.

2.16 The limit of "developing"

Although this paper seeks to give attention to the specificty of planning information systems in developing countries, it is worth remarking that this is no homogenous grouping. Within and between countries there is more differentiation than between the group called developing and the group called developed. In many areas and institutions of the so-called developed world there is as much shortage of skill, equipment and clarity of purpose as anywhere in the developing, and in certain institutions within the developing world there is clearly no shortage of resources.

What is probably worth noting though is the shortage of infrastructrue so that faults are difficult to rectify, and the shortage of skilled power so that the team combination of skills which needs to be built up is easily destroyed if only one key member is lost.

2.17 Information for whom?

It is also worth noting at this stage that information isn't some undifferentiated good which simply has to be better organised. It is a question of power and the organisation of surplus within the economy. It is a question of the organisation and administration of class-based societies where competition among bureacracies and among classes is the normal, not the exceptional, order of things.

The apparently incomprehensible failure of systems is not simply a matter of design, their purpose masks incompatabilities which are not often clear to the designer.

The improvement of a system of collecting repayments on housing loans, more effective administration of an IMF loan, an improved statistical database on the informal sector are not simply technical matters, they are mechanisms for the relocation of resources. As such they will meet resistance and opposition.

3. TECHNICAL ADVANCES

I do not want to describe the technical changes which I think are the driving force which has enables us to reopen discussion on information systems design as I presume readers of this paper will be aware of them. All I wish to do in this section is a checklist of the issues which I think are relevant. However the powerful combination of microcomputing, commercially avialable software and telecommunications developments are I think only partially understood by information systems designers, and developing an awareness of these facilities among development planners must be the central issue to which training addresses itself.

There are six areas within which we can discuss the new technologies. Each of them has a large range of commercially available software and some considerable experience of applications has by now been written up. I would argue against trying to develop in-house systems from scatch until all the options these present has been tried. Indeed, I would go further and suggest that if current procedures don't quite fit easily into a standard package, then change the procedures rather than write new software.

3.1 Database Management Systems (DBMS)

What is usually meant by a DBMS is the software which allows a set of data to be managed in a particular way. A library catalogue is probably the simplest way of grasping the idea, but rather than just the author and subject listings which would previously have been managed with cards, you could sort into a new order, search for a particular term, insert a new entry into the right place, and print out a selective bibliography, all from the same data, only entered once. You can, in other words, set up relationships among data which previously could be only sequential or hierarchical.

The best known microcomputer based relational DBMS package is probably dBaseII, for which there is now an extensive literature. It will run on almost any machine running CP/M, and work in Britain on the Proteus project has successfully moved data on one site in dBaseII into a database set up on INGRES (a UNIX based system) on another site through a network.

In turn dBase files can be moved into Wordstar or other word processing package for the preparation of reports. It also contains a count facility, boolean operators and basic arithmetical ability..

The important point here is that the skill lies in setting up the data structure, in other words analysing the objectives of the institution and the infomation flows within it, so that ideally any piece of information (a datum) is entered into the system only once in its history.

In Britain though the reality of data acquisition tells rather a different story.

The Business Statistics Office within the Department of Trade and Statistics have used the method on about thirty data entities covering all British companies to upgrade their facilities from punchcard to interactive searchable database, publishing data in a variety of media. This economic data can then be bought by planning authorities.

Industrial Markets Location survey annually all industrial properties and build up a database from which they can then answer specific questions, or provide output. The Greater London Council buys this data to use as the basis of its planning operation on economic activity.

At the other end of the scale, Hackney Borough Council uses a small software package on a microcomputer to store annually recorded data on the 35,000 economic activities which take

place within the borough. Three surveyors cover the entire area annualy.

What is missing in these examples is any indication of the planning of information systems, the practice is rather an ad hoc aquiring, by different methods for immediate short term purposes, whatever will best do. In the first case the data is provided for a market by central government, in the second by the private sector, in the third it is collected and entered in house.

3.2 Geospatial data systems

A geospatial data system is a particular type of database, where the data consists of digital representations of surfaces. The British Government Ordinance Survey is engaged in an exercise to digitise the entire Ordinance Survey Map series. At the other end of the spectrum with a digitising board costing a few pounds and a plotter, you can digiise your own maps. The expensive part of the operation is the time involved in digitising. Building up a database of maps already digitised, their scales, types, areas, so that this data can be transferred into a new application is one of the simple, money-saving exercises which never seems to get done.

An alternative to digitising is to buy in digital data from a remotely sensed survey. Ariel photography can be done from an aeroplane or a satelite and gives you a picture, digitised it gives you data which can be read into another computer and have operations performed on it. The cost of ariel photography versus buying tapes from Landsat for example is a question of the cost of the survey, not the technology.

Once the digitised database exists the interesting exercise then is how to give a spatial component to economic or demographic data. Microplot, developed by Ian Bracken of Univeristy of Wales Institue of Science and Technology is a microcomputer based system, written in Basic which will enable data to be taken from say a dBaseII file into the digitised polygons. Mapics is a similar but more powerful implementation running on a minicomputer, developed at University College London, which has been used, among other places, in the plannning of Mecca.

3.3 Statistical data and its uses

Statistical databases are again a particular type of database in which the data can have come from any source (see chapter 4 for notes on data sources). They too now have an easily available software package associated with them - the spreadsheet. By setting up a large accountant's book with an open page, the columns and rows can take data from a database and allow you to perform a series of calculations then print them out or share them. Lotus 1-2-3 is probably the best known and most easily available of these.

The most extensive set of statistical data will arise from the decenial census. An interesting development here is that the 1981 data is available down to the level of an enumeration district (about 250 people). The data for any defined ED, or aggregation can then be bought. A software package such as SASPAC, (developed by LAMSAC) will then allow you to set up a query language. In turn this data can be moved into a large scale dbms like SIR or SPSS, both of which are now available in microcomputer versions, so that calculations can then be performed without the full backup of a computer centre.

This data is held on tape within a number of data archives so that you can either buy the parts you want on tape or disc, or search the data interactively and download to disc the sections you want. The local authority then has access to the disaggregated data already in digitised form, where previously they would have had data available only in printed form (which would have to be keyed in), and at a level that they can read it into one of the geospatial packages so that they

can work on areas as small as a block.

The National Algorithim Library makes available a large number of routines which will allow you to perform extremely sophisticated statisitical operations on data. The need for high level skilled statistical computation experts is removed.

The Central Statistical Office will in addition provide monthly tapes of data which have now been worked on by the ESRC Centre for Economic Computing so that 600 of the main datafields may be bought on a floppy disc to run on a PC. This will include economic data from most of the main government sources - financial, imports/exports, employment and so forth.

3.4 Graphics

Most personal computers now have availble packages which will allow you to draw screen layouts, sometimes as part of integfrated packages such as Jazz, and on mainframes there are sophisticated integrated libraries of routines such as Gino. Statistical data can be transformed into graphs, charts can be integrated into reports, colour terminals and four-pen plotters will allow you to produce colour output. Three dimensional rotational packages will allow you to map, for example the movement across a building of the sun by time of day, so that shadow optimalisation can play a part in window design. In turn libraries of building desing parts, related to a database of materials available and their costs can cut the draughtsmanship required to produce a building or a site.

3.5 Management information systems

This type of software package now pulls together the others I have mentioned before and integrates them into a single system. Framework and Symphony are two of the better known which provide the basic software. On the data you can then perform a series of "what if" calculations, make projections, and begin to plan. Some packages have taken the basic skeleton and then worked out a series of applications such as payroll, project planning, income-expenditure and so forth. The general point to be made is that the further the package has gone towards being user-friendly, the less adaptable it will be.

For the packages marketed as planning tools, I think the general point can be made that the more simple the tool is to use, the more simple the view of the world it represents, such that the question must be raised whether it really is of any practical use at all? The more complicated the view of the world - the British Treasury Economic Model for example with more than 300 variables in the matrix - the greater the sophistication of the department required to run it. And even then, for reasons indicated earlier, there is considerable doubt about the benefits to be gained in undertanding from the exercise.

In discussing these management tools, there is a query on the relationship between the operational aspects of a function, its management, and the planning function. LAMIS is an integrated local authority planning tool developed in Britain, yet if it functions with a land-use data base, a property database, a population database then it is as much a matter of processing planning applications as using the aggregated data for showing trends.

Decision support systems, expert systems and intelligent knowledge based systems can be seen as developments of the basic idea of a management information system where increasing sophistication is built into the software design in order to either improve the capacity of the manager, or allow for increasing the skill levels of operators.

3.6 Communications and networking

The old complaint of the incompatability of computers has been changed markedly by the development of a range of communication devices. The Kermit library for example will allow you to move a file from any micro for which it has been developed to any mainframe on which it is running. Terminal emulators will allow you to use a micro as a terminal to a mainframe. Networking communications software will allow you to move files from one machine to another over the ordinary telephone network usually called the PSTN network, over digital data networks, in the public domain usually called the PSS network, over internationally privately leased lines, such as the IBM Network, by optical fibre, by satelite, or by any combination of these. Data can of course still be copied onto a disc and popped in the post.

The advantage here is that you can develop the level of computing power adequate to your immediate purpose, but the main datastore can be accessed when the data is required. Electronic messaging allows you to then share files, set up meetings, maintain diaries. Experience is that all this leads to an increase in the amount of paper following, not a reduction.

It does not take much imagination to see the scope for a planning department processing the planning applications, the bread and butter of local authority administration.

3.7 Summary

I have not gone into any detail in this section on the ranges of software available, simply indicated the orders of magnitude. Directories of available material are now commonplace. An interesting exercise is being undertaken by the World Bank, of spinning public domain software broadcast through a satelitenetwork, which may then be downloaded by any public sector body in the Third World wanting and able to make use of it.

What I am asserting here is that the vast options that are easily available off the shelf software should be able to satisfy most reasonable demands without skilled computer programmers. It does mean though that the planners have to have a particular type of training.

4. WHERE CAN INFORMATION COME FROM?

We now need to move to developments in some of the methods of collecting and organising information. I have already indicated the importance of mapping the existing data sources. Most of these will be ongoing (though an oft-noted characteristic of work in developing countries is the lack of continuity, to which aid-agencies cointribute by their project funding methods) so it is important to set up the mechanism whereby the data can be made as compatable as possible to the widest range of users. These will include maps, archives, very important and badly documented sources such as pipe, drain and supply routes, surveys.

Information is more than data. Data can come from many sources in a wide variety of formats. To be turned into information it must be purpose orientated.

There will always be projects though for which data will be unavailable and have to be collected from scratch. Questionaire, survey, sample survey, interview, all standard techniques within the social sciences are extremely expensive and need to be written into a project with great care. Training needs to point to the dangers of the temptation to hold back on a project on the grounds that there "isn't enough information" which must be resisted. There is never enough data, the question is whether you can get by. Any exercise in the collection of new data must follow a thorough analysis of everything available and a clear costing of the exercise within the project.

A source of material frequently ignored is the PhD literature in the local university and the fieldwork done by US or European students. American PhD literature is easily accessable on Dissertations Abstracts Online, and UMI publishes free the subject and geographic catalogues from which texts may be ordered on microfilm for $19. British and European material is not available as easily, though there are a series of projects working on this.

Material from projects which doesn't get as far as a fully-written up thesis might still reach the level of a journal article. Even newspaper articles can contain information of use. The work of the Greater London Council in setting up a research and intelligence section broke new ground in Britain, now being repeated in a number of other local authorities. I have already remarked on the unavailability of sub-national data and the limitation this places on the work of the urban or regional planner.

In the case of the GLC the work went even further when they found that spinning their database drew too great a contribution from their computer facilites: the next stage they went to involved spinning their database, now called *Acompline*, on the European Space Agency host. Finding that they were having to pay increasingly to make use of their own data, they undertook the task of reformatting data from ISIS to STAIRS and with the upgrading of the GLC computer facility in turn being able to spin it in London and provide a free information system to the contributing boroughs as well as their own officers. The information system then went through three phases in the process becoming the major organisation of published and unpublished documentation on local government in Britain and probably in the world.

Databases of ongoing projects need to be built up as a matter of urgency and documentation centres of project material, so that the benefits gained from previous experiences are not lost. Indeed this argument can be taken further. Until you can adequately document ongoing projects the allocation of new money cannot be measured against value gained from previous expenditure. In turn the point I made earlier about information for policy growing from information with an immediate value return indicates that from project management systems can be aggregated the data for the planning application with no increased cost. As many projects are in turn funded by

Aid agencies, either bilateral or invovling UN type organisations, which will maintain their own information systems, these bodies should be looked to as sources of data. The UNDP Project Management System should be looked to and I would like to draw attention to the work of ACCIS Register of Development Activities and its newsletter for information on improvements in the general UN information scene.

It is also worth drawing attention to the Kenyan Government database, Compendium of Development Projects in Kenya, produced by the Ministry of Finance using what looks very much like Lotus 1-2-3.

The wide range of research facilties undertaken by university departments of Development Studies and so forth are underutilised. Indeed one might make the remark that a characteristic of developing countries is the lack of integration of the information infrastructure. Training planners in the nature of the information market is an important component.

Codes of practice, international standards and testing of materials are important information sources for which wide international networks now exist and regional or national networks such as ARSO (the African Regional Standards Organisation) are developing. It has long been recognised that unsuitable standards and codes of practice are an impediment to developing human settlements, yet planning departments often appear ignorant of work in this field.

Brenda White's work of 1973 still remains the most comprehensive introduction to data sources, though now sadly out of date. Surveys and studies have been done in a number of other countries, including Conroy and Donaldson. Surveys of information sources, project documentation, thesis literature, working papers and so forth are being developed for a number of countries and regions. Extensive searches on a range of databses indicates the weakness of organisation of documentation, in which there is much scope for improvement at little cost.

Who is responsible for organising the training of the planners who are going to set up this part of the information infrastructure? The UNISIST principle has established the idea of the national centre for science and technology. A number of these now exist in developing countries. But there is little evidence that they provide a research facility for planners, even though their directors have in general accepted that the social science is a proper part of their activity.

It is clear that planning departments are badly supplied with documentation centres, links with national statistical centres, surveys and computing centres are weak or non-existent, as are links between ministries where the interests I have been discussing overlap. The strategy of a local information plan has much to commend it. Until we have trained the information systems designers however, we are without chicken or egg.

5. TRAINING OF CLERICAL AND TECHNICAL WORKERS

Having outlined the method of information systems design, the range of information and the technical changes, and the sources of information, we need now to address some of the questions about how training can best be conducted.

I start with the layer generally ignored for two reasons. If their willing participation has not been won to the development of a new information system design, then it will fail. The wide variety of methods of putting a spanner in the works by clerical workers who have over many years established working patterns in which they have a control over their conditions are now recognised as an integral part of managing systems development. It is only when they understand the benefits to them of an improvement in their working environment that they will co-operate.

In addition, in areas of high unemployment where the job security of the public sector is something which has been won at considerable cost, they will fight to protect that position. In Britain it was only by regrading all clerical workers in a department of the Civil Service as data processors that their compliance was won. Where the civil service is particularly protected or recruitment into it brings particular benefits (much of the third world), any threat to their employment and increase will be resisted.

The second reason is that they must understand the trajectory of the project. To regard them simply as keypunchers is to lose the contribution which they can make, and to fail to prepare them to make decisions during the implementation phase. At the most simple level, attempts to introduce Taylorist management practices remove the error checking device which a conscious human provides over the blind keyboarding by piecework payment.

Training must commence during the design phase. The initial survey and 'Delphi technique' period must include a representative sample of these grades, and, if unionised, their representatives. The training, regrading and working conditions for the implementation phase need to be worked out now and included in the project budget.

Information systems design, at least in Britain, frequently cuts across the traditional departmentalisation of planning institutions and well as the divisions of labour. Responsibilities between clerical and professional grades become blurred, or break down. Training must therefore include sessions on the aims of the operation, expectations, objectives, stage by stage, and evaluation. Where new skills will be required, digitising, keyboarding, running short application programmes, responsibility for maintainance, and so forth, training components need to be draughted and budgeted for. Most of this training can be done in-house, though there is a distinct benefit in taking people away from their environment, either to a training centre, or to an application which is already working. If these grades can discuss with and meet with others who have been part of a sucessful installation, this will be helpful.

It is also important to bear in mind that during the implementation phase some of the people might well show an application for this sort of work. It is important to ensure that no structural impediments exist to prevent them moving onto professional grades and engaging in the next level of training.

During the design stages the budgeting for training has to be allowed for. The increase in workload during the transition period must also be taken into account.

Not only does one have to deal with the training of these grades of workers, but the professional information system designer needs to be trained to take these issues into account, as must the cost of entering data and of running the established system in parallel.

6. TRAINING FOR NEW YOUNG PROFESSIONALS

The training here needs to be seen in two parts, those who are still undergoing undergraduate or post-graduate education, and those who have recently qualified, say in the past five years.

There are two sides of the field of training which need to be taken into account:

the contribution of information systems design in a conventional training for a particular discipline;
training of professionals in information systems design.

There is, I think, an argument to be made, that professional training at this stage has taken on too deeply the division of labour which is the practice in the developed countries. Courses in a variety of disciplines from which planners are drawn need to have components introduced into them which include the principles of ISD, project method, elements of information technology, in other words, the bulk of what I have dealt with in the earlier part of the paper.

For architects some of the CAD and MIS are begining to appear already in Britain. Yet I suspect that the amounts of money involved in big practices means that university training lags behind the most advanced practice. It is likely that western construction companies which win projects in the third world will be providing expatriate practitioners more aquainted with the new technologies - the divisions of experiece are going to widen. Micro based versions tend to be too simplistic in their modelling capabilities to be of real use.

For geographers the use of remote sensing, computerised demographic studies, MIS, computerised cartography and similar parts of the field are also emerging. For economists and the general social scientist too, they are likely to introduced to the current levels of computer training at least at the level of dealing with statistics.

Engineering as a discipline has a wide range of computational tools which are increasingly easily available including at the design and project management level as well as calculation.

Experience in Britain has indicated that people who come from a computer background are themselves indaquately prepared to teach the applications which might be useful in policy and planning or administration. They are too technology-centred and concerned with theoretical niceties which do not take into account the practical operating environments of the users. There is not yet the richness of experience necessary to release the practitioners who have been designing the systems and implementing them for long periods to train a new generation. Most reliance has to be placed on the current teachers from the backgrounds of the traditional disciplines but here the danger is that they are the ones who have the most to lose by the new technologies and will be reluctant to make the change. Retraining this layer is probably best dealt with by considering them as senior planners.

In turn it is very difficult to give people whose initial training is in computer science or data processing the skill which is required to become information engineers. There seems to be in Britain a real difference in attitude or temperament between those who follow a technical bent and those who have a more social bent. Without wanting to plunge into kitchen sink psychology, more work needs to be done, both comparatively internationally and inter-disciplinarily to try and pinpoint causes and transferability of this characteristic.

I don't want to go into great detail on syllabus or curriculum with this level of training; these questions are being considered by the bodies responsible for each of the disciplines and I think the divisions still too great for any generalised practice to have appeared. I would suggest that it is unsuitable to introduce "computer science" or "programing" into a social science background; but it is extremely important to cover the questions I have discussed in the earlier part of this paper. On the other hand I think it essential to introduce "information systems environments" into computer science courses.

It is almost certainly too early to talk about undergraduate or immediate post-graduate level training in information systems design as a subject in itself in most developing countries; there are still very few such courses in Britain. Just as it is unclear that there is a discipline called "planning" and there are few undergraduate courses aimed at producing "planners"; so a quandary exists whether ISD should properly be a course in itself. Crudely put, the quandary is that if the training is at too great a level of detail no sense of system emerges, only a technician; if at too great a level of generality, the system disappears, all that remains is a vague eclecticism. A valuable exercise would be a much more thorough piece of work on developments current in Europe and North America to monitor opinion as information engineering becomes more established

The next level of training, the masters level, I have discussed in some detail in the section on advanced training for senior planners. If the first degree deals with broad education, then the second degree needs to be the time when the vocational training is introduced. There is a certain qualification inflation which has led to this being the case. There is a very strong argument for as much of this as possible being conducted with work experience.

A further area of training is PhD level research. There would be some opposition to considering this training at all and it opens a topic which it is not the province of this paper to discuss: the agenda for research in the field. That requires a paper devoted to the topic itself. For some years however PhDs in information systems design for planners at the regional and urban field have appeared, both dealing with particular developing countries and by students from developing countries, as well as studies from the developed countries which raise questions of relevance. It is usually only at this stage in a career that the number of years necessary can be devoted to a research project. There is room for considerable argument though both that a young professional cannot afford to spend this amount of time away from practice and that this level of 'training' ought not to be able to consume scarce resources.

Yet without the building up of a cadre of professionals who have had the depth of study which this level allows it will not be possible to develop the in-country facility which is required for lower level training.

I do not want to deal with this question in detail, it is a matter for a much more general paper on training in developing countries with nothing specific to planning; merely to indicate that the question exists and needs to be taken into account. The UNCHS has been supporting a project to investigate the training of human settlements planners, to which I would draw attention.

During the early years of practice the new young professional needs further in-service training. What is emerging in Britain is a process sometimes called a thick sandwich. A couple of years of full-time university level education are followed by a year in a workplace, then another year at university, followed by a couple of years of workplace experience leading to a professional qualification.

Training in information systems design could, I feel, benefit from this sort of package. People at work get the advantage of seeing in practice what the job is like, the workplace gets the benefit of experience of new ideas. This requires a high level of co-operation and co-ordination between the training institution and the employing authority, which might not be the practice within a particular country. Experience in Britain indicates that it takes a considerable effort to make it work. There are also considerable historic impediments in the traditions of what comprises a university education which would require considerable organisational change.

External support for a project developing training facilities of this sort might well be necessary. The World Bank funded project in which University College London (UCL) co-operated with the Institute of Technology Bandung (ITB) in the setting up of an M.Sc. course in regional planning might be a pattern for aid work to take in this field.

These types of undergraduate and post graduate training in turn lead to questions of the availability of equipment, both hardware and software, and to access to suitable datasets. The planning of an infrastructure within which training can take place needs to be part of the planning process and aid projects involving a planning component should take this into account.

This discussion of training for the young professional needs to consider also the paraprofessional, those grades above the technical but below university level.

Training in general at this level is difficult to discuss. There are so many variables which have to be taken into account. This level could include "bare-foot planners", local leaders or activists who have been incorporated into an administration or community participation exercise where they are involved in the collecting of information and its inclusion in the planning process to those implementing a system. I think we can safely say though that these people will be unlikely to be involved in the design other than as participants and they are unlikely to be taking a role in initiating training.

For all grades at this level of their professional careers there is no longer the need to take them away from their home country for training. However the building of adequate departmental facilities in-country can properly be considered as a need. M.Sc. and Ph.D. level students will certainly want to travel. In many cases they do this at their own expense. I feel that this level of training is better provided to mature practitioners when coming out of the public purse.

7. MIDDLE AND SENIOR LEVEL PLANNERS

We are now on more solid ground. There is some experience on which we can draw. Third world practitioners have been trained as part of Aid programmes for many years, there has been much research into proper, suitable and approriate training as well as a critical literature on practice, I have referred already to UNCHS work in this field(Wakeley and Miller, forthcoming). There is now also the experience of the past twenty years work on ISD for policy and planning in the developed world, though there is not yet I think an adequate body of evaluation.

Just as the earlier part of my paper dealt in turn with information systems that exist, then the implications of the new technology, then the sources of information, I'd like to suggest that training should be outlined in the same way: a look at how things are done now; the technical changes which are taking place; information systems as they could be designed. However I fear that in practice much greater prominance will be given to the technical component.

We need to consider the issue in two parts: what should be the content of training, and in what form is it best conducted? I would suggest that the content required is the taking of experienced practitioners who have grown up in a particular tradition and discipline, in particular institutions, operating in specific ways, and pulling them back in order to gain a general picture of the actual results of their practice. This can be best conducted by taking them from their normal operating environment and letting them see how things are done somewhere else. From this they get the chance both to ask why it is done in this way here, and why they do it in that way there.

But often what they desire from training is a new technical competence plus the cadre-point of having studied overseas. To produce the change in attitude is seen as introducing material which has an irrelevance to the detail of practice. We then must be trying to do two things at once: to give the improved technical competence but also the perspective which indicates why the previous 'proper' technical competence which was part of their initial training is now no longer adequate. This they will be perceive through the experience of technical change. Possibly more than anything else, this is the real value of what computerisation can contribute to an organisation.

What form can this changing of attitude best take?

One practicality is that only those for whom the training will be of least value can be spared from their work long enough; another is that the sources of funding are not necessarily in any way linked with the most appropriate training

In general we can divide training into in-country and overseas. Each can in turn be divided into short courses and long courses. Each can also cover: ISD as a topic in itself, one of the parts of ISD as a topic in itself, or a component on ISD within a more established tradition. Often this will be more a matter of 'computers and..' rather than ISD, but let us start from where we are.

There is also a pattern that greater training emphasis has been put onto 'rural' than 'urban' by aid agencies. Despite the title of this paper I'd suggest that there probably ought to be no great divide.

The first major factor influencing the pattern of training in Britain is that the aid agency, the British Council, will not bring people to Britain for less than three months for training. There is also likely to be a follow-through of the World Bank pattern of training being

increasingly project oriented. Projects do not of themselves produce ISD design exercises other than at the micro-level. designing the information system for a project is an aspect of training for which provision should be made, but project oriented funding does not lead on to proper urban information systems.

The World Bank funded project in Jakarta for an Indonesian Urban Information System for the Ministry of Home Affairs looks like it might be moving in an interesting direction; it will have an extnsive training component so should be worth following. The EDI proposals for building a training network will bear watching.

However the ISD component, or more correcty the computer component of a project is often written into the original project outline, from which training follows. Equally often though the computational component was introduced by planners without the training which the professional has been sent to gain. Ergo the project has inadequately allowed for the benefit of the training which will be gained in giving space for change. Where mainframe computing facilities are included this can be a major impediment. The practitioner, during the course will be introduced to new ideas of ISD during case work, but his response will be that he has to work within other parameters.

In Britain there are few long courses (long courses here usually mean at least one year, short courses about three months) which are aimed specifically at third world participants. Instead there is often complaint that the larger part of the course was unsuitable for the participants particular envirnment. Courses in higer-level scientific disciplines particularly present this difficulty. The narrow-focus of such a course ill prepares its participants for dealing with real-world ISD problems, a point I have alluded to earlier. Smithson and Land have commented at length on some of these issues.

This is not a problem limited to third world participants I think. There has been an increaing debate in Britain on the suitability of much training for middle and senior management from British industry. A course with which I am involved, although not aimed at third world particpants might give a clearer idea of what I mean.

It has been found in British industry that there is a shortage of skilled managers who understand both something about computing and management - the business applications to which computing can be put. The M.Sc. course we run at Kingston Polytechnic takes people who have already something like ten years of experience, usually from a computing background, who are at a level where they should be taking on senior managerial apointments. They are released for seven weeks a year for two years to attend full time at the residential centre of the Polytechnic. During this time they receive lectures, take part in case studies, deliver seminars and discuss topics, arranged under eight compulsory headings and eight optional, of which they take six. At the end of each year they are examined. In addition, in the intervening period, they must prepare information system design exercises which are also marked, and, throughout the two years, work on an industrial project, which is continuously assessed, and on which they are expected to work for a further fourteen weeks. The components of the course include information systems design, developments in data communications, management, expert systems, office automation, and so forth. Their projects all have to include both a theoretical component and to have reached the stage of practical application of prototyping - in other words understanding the social, political and economic environment in which any information system design exercise is undertaken is as important as having a technical grasp of the issues.

In my opinion this course is still too technically oriented for people who already come from a technical background and would presume too high a level of mathematical and computing skill for someone who was coming from a traditional professional background, but it does seem

to be moving in what I consider to be the right direction. We have already been able to involve local government and planning officers on the course, who are producing interesting work. This is certainly the only course I know of in the UK which is taking this approach.

Let us now move on and consider how the training of third world participants is undertaken in three departments of University College. In the School of Librarianship and Information Science about a third of the MA course are from the third world. It is generally recognised within the school that the course is really in British information science and that it does not address the questions of circumstances of low literacy, very high rates of change, relatively low per capita income or the absence of social security.

In the Department of Photogrammetry and Surveying there are a number of third world participants, some of whom are planners, working on survey methods and new technologies and their contributions to surveying. Yet again it is generally felt that they are being introduced to specialisation at a very high level, to technicques which require a very high level of infrastructure support, in an environment where the social and poltical issues facing developing (or developed for that matter) countries are rarely raised.

In Computer Science there are again students, up to PhD level, from the third world who are being given access to among the most advanced facilties which can be offered in Britain. One is for example a Kenyan statisitician. Yet one must again ask, is this really either what he needs, or what statistics in Kenya needs? I could go on giving examples like this from UC, but would not wish the participants to be identified too easily. In most cases these people will be fairly senior government officials concerned at some level in 'planning', though they will not all have come from either planning ministries or planning departments in local government.

In the Development Planning Unit, which is a department of the Bartlett School of Architecture and Planning, almost all students are from the third world. The Unit is specifically designed to address the planning problems of developing countries and to train their officials. Courses are run both at the Masters and the short course level. I must say that we have not successfully introduced what I would consider to be a sufficient ingredient of the new technologies and their implications. Each course has a small component if only of the "computers and..." type. The possible exception is the Planning Ports for Development short course where containerisation and roll-on-roll-off has made it more difficult to ignore technical change, even if these two technologies are not generally considered as main component of those affecting planning. The study of major European ports though does make an introduction to the more obvious technologies inevitable as they have been much more deeply affected than for example in local government planning authorities.

There is on the other hand no course devoted to Planning Telecommunciations for Development, or an informatics component in any of the other courses.

A survey of students over the past three years indicates that almost all recognise that 'computers' are going to have an increasingly important part to play in their jobs and, increasingly, students have already had some contact with them. This is usually at the level of large mainframe installations, and often initially through payroll applications; indeed it has been from the experience of trying to work on this batch processing with unsuitable software that much of the difficulty has arisen.

The difficulty of introducing an adequate level of computing into already established courses where only some of the participants had an immediate need; the difficulty of introducing something at a level to sustain interest and enable people to grasp relevance when their own experience was so widely different, decided us that we should offer a special one month option

during the summer, specifically on computers for development planning. I am not suggesting that this is how it should be done. To concentrate on 'computers' is not to train in information systems design. One could offer a course in ISD which had no computing component at all (though it would be increasingly incredible). One could offer a course in computing which had no ISD - which concentrated purely on the technical and 'computer centre management'. But to train planners in ISD now I think you have to start from the technical change which is reopening the subject.

The one month course is I think sufficient to introduce the average planner to the range of computers available, to understand the terminology and the possible applications, and to give him the hands-on experience of a microcomputer that he can undertake elementary word processing, database management and spreadsheet design.

Needless to say, the participants in the course, which has now run for three years, were self-selecting in that they wanted to participate, and randomly selected in the sense they were already in London and could be financed. People who regard using a keyboard as beyond their status would have selected themselves out. (Indeed one of the factors that influenced the ability of participants to master the course was the confidence which came from being able to type. Those students who could already type were at a distinct advantage, even though the speed with which you can hit a key is not of particular importance.)

The course has three parts, of equal importance. There is an introduction to the basic technicalities of computers, how they work and what can be done with them, within the framework of systems design. Much of what I covered in the first two parts of the paper is what is covered in the four weeks of the course.

In parallel, and starting on the first day, is hands-on practice with a microcomputer, one per participant. I tried group working, on the egalitarian idea that the strong would help the weak, but found it did not work. There must be a machine per person. I also found that an assistant is essential, probably at the level of one per six course participants. Discs get corrupted, loaded in up-side-down, the dfifference between software and operating system gets forgotten; an endless procession of small details, not just in the initial stages, requires individual attention. But assistants add to the cost of the course.

The third component is visits to a series of planning authorities in Britain which have developed their information systems to different levels and in different ways. Some of them will still have no computing facilities at all, some will have gone quite a long way. There is none however which I have come across so far where there has been the planning of information systems design and development throughout the authority, though there are signs that planning is begining to emerge. I draw on articles in the *BURSIA Newsletter* to which I referred earlier, plus my personal contacts for places to visit. I also try to ensure that we don't revisit the same authority twice. Planners in planning departments have their own jobs to do and can't spend much of their time offering free training.

During the introduction to the technology and the visits there is a thread running through the course which is an attempt to understand government policy and its contribution to development in Britain; at the same time to raise the question of the relative responsibility of local and central government for the development of information systems design and implementation in a developing (or for that matter any) country. (I would like to examine in more detail the development of British policy over the past fifteen or so years, and compare it with that of for example India, but that is the matter of another paper.)

It might be worth noting that I do not think there is any point in attempting to teach

'programming' in any established 'computer language'. It is not only that I don't think this can be done unless continual application will follow, just as you can't learn a spoken language without continually practicing it; it is rather more that I do not think this is the sort of skill which a planner needs to have. As I indicated in an earlier part of the paper I think that commercially available packages are by far the most suitable. (I understand that PADCO's package for example is based on Lotus 1-2-3.) This seems to me to be much more sensible than following UNCHS with its Urban DBMS and developing something from scratch in Basic.

In one month I think a planner with no computing experience can gain a sufficient understanding of the technical changes which are taking place and their implications for his/her work that they can understand the literature and discuss the options open in a particular situation.

What we have also tried is for someone then to work for another couple of months, under guidance, trying to design his own specification for a particular application. This path which allows for a much more detailed study I think is worth following.

This is still not yet however to teach information systems design as a discipline for policy and planning - we are only giving the bare bones of an understanding of what is going on and the ability to grasp the implications. The next stage in our development is I think is a three month course in Information Systems Design for Planners from developing countries. We are now planning an inter-departmental M.Sc. in information technology for development. These courses would have as equal components:

information systems design;
development planning;
specific applications geared to the area of planning in which the participants are working.

These courses would be interdisciplinary, involving staff members from a wide variety of departments within the College, for it is now far beyond the expertise of any one person to hold the detail required. The participants would include senior practitioners both from Britain and developing countries so that the major benefit of the comparative method could be realised.

This approach to teaching information systems design is still I think novel in Britain. Just as the divisions I have remarked upon influence the teaching at UCL, I think most other institutions in Britain suffer the same impediments. Where special courses exist for third world participants: the Universities of Bradford, Manchester, Birmingham, Swansea, East Anglia for example, there is as yet little attention paid to computerisation, and no courses in information systems. At Manchester in the Department of Administrative Studies the courses are given an introduction to computing, at Birmingham in the Development Administration Group there is as yet no formal training at all. It is probably also worth noting for the purpose of this paper that most institutions in Britain concerned with developing countries have a predominantly rural focus.

The University of Wales (UWIST) has announced an M.Sc. in information technology for planners, which they say will be suitable for participants from developing countries.

The Overseas Development Group at the University of East Anglia now also offers a short course in microcomputing for development planning which is possibly similar to that offered at the DPU. I have not yet seen others advertised. It does seem clear though that this area is to grow. The Planning Adviser from the Ministry concerned with aid in Britain, the Overseas Development Administration, has asked me to convene a seminar to discuss the experience so far on introducing training for planners in the new technology. Again the emphasis should be noted:

still a long way from ISD, but I come back to this point fairly frequently; we have to accept that the reawakening of interest is a result of the changes in technology.

There is of course an alternative method of proceeding. This is to take people who are predominantly from a computing background and give them training in developments in new technology. The United Kingdon Council for Computing Development (UKCCD) has followed this approach: training managers in computing. The course run at the Central London Polytechnic has been their flagship. It must be born in mind that the participants are not planners. In addition I fear that there is insufficient attention paid to the applications which will be of concern to planners. We do not yet have sufficient experience to really be able to evaluate all the attempts that have been made. The UKCCD organised a conference of third world students working in Britain in the field of computing last April, which was attended by more than one hundred. This exercise is to be repeated. It was aimed predominantly at people studying computer science. When the Third World Planning Seminar was held in July it did not discuss the new technology although there were many third world planners present. I think we are still a long way from achieving any sort of synthesis.

Experience is now also indicating that students arriving in Britain are at a considerable disadvantage relative to British students. We are to run this year a trial course of one month aimed at M.Sc. level experienced students from the third world who are coming to Britain, where they will get an upgrading of their skills on current technological developments to better equip them with the level of work they can expect in the full M.Sc. course.

I could take line of argument on the unsuitability of much current training practice into Europe. The UDMS (Urban Database Management Symposium) has now been held for ten years. Recently the organisers have begun to pay attention to the particularity of the third world. Yet I think one has to say that firstly, as a result of their own particular trajectory, they have a one-sided approach to urban planning information systems and secondly that the third world concern sits uneasily beside the main stream, rather than swimming in it. A more detailed survey of European practice is now beyond the scope of this paper, but would be worth making. See the UN.ECE paper cited.

So far we have been discussing training at the formal level of courses run usually at a University and usualloy outside country, funded by aid which usually means tied to the aid-donor country.

Anotner valuable training mechanism is the formation of a professional body. From the traditions of the Royal Town Planning Institute, the Royal Institution of British Architects, and others there have been set up local versions in some developing countries, which have survived with different levels of succcess, producing journals and newsletter, holding conferences and participating in international bodies and meetings.

The work being done within the Ministry of Works and Housing of the Government of India indicates that the experience of the Urban and Regional Information Systems Associations, of which one exists in North America, the British I have referred to, and one in Australia could well be built on. In December 1985 there was to have been a regional conference in India, one of the conclusions of which would have been the setting up of an Indian Information Systems Association. I had hoped to have had the papers and conclusions of that conference before sending off the draft of this paper.

Those professionals from a computing background also have the experience of Computing Societies on which to draw. The British Computing Society has recently signed an agreement of association with that of Singapore. The Malaysian Society publishes a journal in which appears

matters of interest to information planners and the formation of the Philippine society has been recently announced. (The work done in both Singapore and Malaysia on information planning needs to be written up in more detail.)

These bodies in turn have international links, such as the International Federation for Information Processing, which has a working party concerned particularly with developing countries.

At the level of these professional and international bodies though we are left with a problem. Training will be a matter of interest and concern to them, even if only one among many. Secondly information systems and their design will be of anything from central to marginal importance. Thirdly urban and regional policy and planning questions will again be at best only one among a number of issues. Fourthly the particular concern for development planning and the third world is likely in almost most cases to be a minority interest. So in each body we are talking about a fourway division of interest. It is unlikely that there will be many people in any part of the world with a sufficient interest population to sustain a body capable of generating a discipline, just as it is unlikely that a faculty with even three out of these four interests could be maintained.

In Britain we have found that if you start on the one hand with the issue of the third world, there are a number of institutions concerned with training and ploicy and planning. Within that field there are some interested in information, systems and design. If one the other hand you look at the techical institutions there are always a few people who have a third world interest or consultants with a third world experience who want to remain in touch. We have set up a body called Development Information which produces a newsletter, has periodic meetings and consists of self-selecting members, most of whom come from Institutes of Development Studies. Then there is the British Computing Society Developing Countries Group, the Development Studies Association, BURISA, to which I have referred already, the Library Association International Group, the Institute of Information Scientists, and the Association for Information Management (ASLIB), the British Council, the Third World Planning Seminar, the Remote Sensing Society and the British Library Research and Development Department. Development Information then becomes the point of contact for the four way interest I outlined earlier. We also get the benefit of building on the work of others, for the fourway division this paper addresses is likely to be the poor relation of each of the four directions from which this meeting point has been focused.

The value of conferences and seminars for reinforcing on training and providing a mechanism for keeping up to date needs mentioning. It would be useful if annoucements were effectively networked so attendance on courses - generally any out-of-country visits could be the result of manpower planning, to make use of limited budgets.

In another paper I have outlined in detail how one particular exercise in information systems design for urban planning in developing countries builds on the strength of others. I would argue that the training factor needs to work in the same way, in Britain and in the developing countries too.

8. POLICY MAKERS

This is rather a difficult term. There is a considerable literature dealing with information systems for decision makers, decision support systems, and similar phrases yet no agreement on who these people are or what they actually do and attempts to investigate their information requirements have been disasterous. There is a confusion whether included here are senior officials and/or elected/political figures.

It is also difficult to talk of 'training' at this level.

Further, there is an important argument on strategy of actual information systems design which needs to be dealt with. At which level of the bureaucracy do you attempt to implement your system? Crudely put: if you go for a general co-ordinated policy across an extremely large institutional framework you never get a sufficient agreement; if you go for getting started you have different and unco-ordinated systems. This applies not only to types of computing equipment but levels of aggregation, data definition, periodicity, and so forth.

Every time one gets beyond the generality of ISD into a particular situtation, often in a consultancy or tutoring a student, while you are trying to define the problem with which you are dealing, you are presented with a series of questions on boundaries of problem and difficulty of defining point of departure and points beyond which you do not want to go. To give an example: a group of students from a number of state level governments in India were discussing regional housing information systems. The question they raised was whether they should each go it alone in their own authorities, co-ordinate at state level, or whether the Ministry of Works and Housing should properly co-ordinate a plan for India. This question needless-to-say was not simply a 'technical' one, here lay questions about the relative power of state and federal government.

The level of training which deals entirely with policy and not with execution harbours a further difficulty. If policymakers attempt to avoid understanding the technical (just as the argument goes, using a keyboard is demeaning), trying to implement a system is dogged with difficulty as the people who have to make the technical decisions find that possible mistakes are not comprehended. Results are anticipated which are unachievable with the level of investment. This again is not a problem with anything specific to developing countries or planning. The National Computer Centre in Britain and the Open University have both produced excellent training material introducing the difficulties experienced if board level members and executives fail to establish a clear agreement.

The body with possibly the most experiece and this level is the Intergovernmental Bureau for Informatics (IBI) which has for many years run seminars for policy making. Indeed their entire approach to how best to introduce informatics planning in developing countries is to influence those whom they consider to be influential. (I should note at this stage that infomatics is that combination of computers, telecommunications and information which might more commonly be called information engineering in English).

At this level staff will not be available to go on courses, they will almost certainly however have been on courses earlier in their lives (certainly the professional rather than directly political appointments) and are likely to have a network of colleagues from those institutions - an alumni association of sorts - which will keep them in touch with developments. These associations can form a very effective medium for training. The Asian Institute of Technology is an example.

Training at this level has to consist almost entirely of awareness both of technical change

and of implications. IBI has found that seminars lasting a few days which are concerned with orientation are the most useful though these are extremely expensive to run. A degree of co-ordination among aid and training agencies could allow for a more coherent approach. One does hear the point made that every aid agency has a different proposition. The general lack of co-ordination among aid agencies, although it has a rational logic in terms of the interests of the donor countries, is undoubtably an impediment to effective training.

The senior political appointees are the people though on whom, in many developing countries, you are dependant for a successful implementation. Influencing them cannot be underestimated.

9. CONCLUSION

1. At each level of training we have to deal with a change in attitude which information systems design requires: that of seeing things systematically, the relationships which exist among parts of the operation, how changes in one area affect another. In addition the new technology creates an environment of uncertainty and change which makes possible changing bureaucratic structures which otherwise appeared immutable. Thirdly data can be used in different ways, changing the organisation of information systems.

2. The rate of change of technology, its fall in price, increasing reliability and compatability all mean that specialists who can keep up with the change and plan integration of ISD are an important component of any administation.

3. The agency responsible for ISD within an organsiation needs to be selected with care as it will be open to considerable political pressure, because planning and administration can draw on the same data, and because data needs to be integrated across agencies.

4. The unevenness of 'developing' countries has led to a certain mistaken opinion that modern technology is unsuitable, or that there is no scope for ISD. Though ISD may be undertaken with no new technology at all, there is still a need for training in ISD. The discipline is not dependent on the technology.

5. Clerical and technical training must follow the initial planning phase of an ISD. It should be aimed not simply at administering the procedures, but understanding the principles, and the training component should be an integral part of the ISD.

6. The training of new young professionals is the area where innovative work is most needed and will be most easily received. However these professionals will not have the chance to actually undertake full scale designs until later in their careers. To introduce them to new ideas which they will have difficulty implementing in their deaprtments will lead to disaffection.

7. Training material for this level has to deal with developments in technology as I've outlined in the technical chapter, with the data elements and flows of an urban planning ISD, but also with design methodology. Training materials need to be produced in these three fields and tested as a matter of urgency.

8. Training for senior planners needs to be based very strongly on case studies. Training material at a variety of levels using a variety of sophistication of techniques needs to be developed. Within any course aimed at this layer the political understanding of the management of change is as important as the technical: what I have called the information system environment.

9. Policy makers will prove more difficult to introduce to formal training methods. They require more imagination in handling and the inculcation into a culture. International seminars are likely to be important in this field.

10. The literature in this field is still sparse. In each region institutions should undertake the development of documentation centres within centres of excellence. The begining of these collections does not cost a great deal. I will be referring elsewhere to a programme to be undertaken in conjunction with Chadwick-Healey, a publishing company, to make urban planning databases more easily available. I have also referred elsewhere to how sources of software can be made more easily available. Within these centres would be built up collections of

software packages and sample databases. The centres in turn would need to produce newsletters after the manner of *Development Information.* An outline feasability and costing for such a centre should be undertaken.

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